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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/688,541	10/16/2000	Kazuhito Shimoda	09792909-4652	3044

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EXAMINER	
MARKHAM, WESLEY D	
ART UNIT	PAPER NUMBER
1762	20

DATE MAILED: 05/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

MK-20

Office Action Summary	Application No.	Applicant(s)	
	09/688,541	SHIMODA ET AL.	
	Examiner	Art Unit	
	Wesley D Markham	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 February 2003 and 24 March 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,9-11 and 17* is/are pending in the application.

4a) Of the above claim(s) *1-4* is/are withdrawn from consideration.

5)☒ Claim(s) *9* is/are allowed.

6)☒ Claim(s) *10 and 17* is/are rejected.

7)☒ Claim(s) *11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10-16-00 and 2-24-03* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application (i.e., as paper #19 on 3/24/2003) after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office Action (i.e., the final Office Action, paper #13, mailed on 10/23/2002) has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/24/2003 has been entered.

Response to Amendment

2. Acknowledgement is made of applicant's amendment D, filed as paper #14 on 2/24/2003, in which Claims 12 – 16 were canceled without prejudice or disclaimer, Claims 9 – 11 were amended, and Claim 17 was added. Claims 1 – 4, 9 – 11 and 17 are currently pending in U.S. Application Serial No. 09/688,541 (with Claims 1 – 4 withdrawn from consideration by the examiner as being drawn to a non-elected invention), and an Office Action on the merits follows.

Drawings

3. The corrected formal drawings (2 sheets, Figures 14 and 15) submitted by the applicant on 2/24/2003 as paper #15 are acknowledged and approved by the examiner.

Specification

4. Applicant is reminded of the proper content of an abstract of the disclosure. A patent abstract is a concise statement of the technical disclosure of the patent and should include that which is new in the art to which the invention pertains. If the patent is of a basic nature, the entire technical disclosure may be new in the art, and the abstract should be directed to the entire disclosure. If the patent is in the nature of an improvement in an old apparatus, process, product, or composition, the abstract should include the technical disclosure of the improvement. In certain patents, particularly those for compounds and compositions, wherein the process for making and/or the use thereof are not obvious, the abstract should set forth a process for making and/or use thereof. If the new technical disclosure involves modifications or alternatives, the abstract should mention by way of example the preferred modification or alternative. The abstract should not refer to purported merits or speculative applications of the invention and should not compare the invention with the prior art.

   Where applicable, the abstract should include the following:

(1) if a machine or apparatus, its organization and operation;

(2) if an article, its method of making;

(3) if a chemical compound, its identity and use;

(4) if a mixture, its ingredients;

(5) <u>if a process, the steps</u>.

In the instant application, the abstract should refer to and describe an optical component producing method for forming a multi-layer film (i.e., the abstract should be drawn to the claimed invention, which is a process, not an apparatus).

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 17 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
7. Specifically, Claim 17 (which depends from Claim 9) requires that the "lower refractive index layer" be SiO_2 and the "higher refractive index layer" be Nb_2O_5. However, there are a number of different "lower refractive index" and "higher refractive index" layers discussed in Claim 9 (e.g., the plurality of alternating lower and higher refractive index layers that form a basis for a stack, the higher refractive index tuning layer, the lower refractive index layer deposited on the tuning layer, etc.). Therefore, it is unclear to which of these layers "the lower refractive index layer" and "the higher refractive index layer" recited in Claim 17 are referring. In other words, does Claim 17 require all the lower refractive index layers to be SiO_2 and all the higher refractive index layers to be Nb_2O_5? If not, which and how many of

the layers are required to be SiO_2 and Nb_2O_5? As such, the scope of Claim 17 is vague and indefinite.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. The rejection of Claim 9 under 35 U.S.C. 103(a) as being unpatentable over Holland (USPN 4,311,725) in view of Rahn (USPN 5,483,378), set forth in paragraph 9 of the previous Office Action (i.e., the final Office Action, paper #13, mailed on 10/23/2002), is withdrawn in light of applicant's amendment D.

11. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over de Vrieze et al. (USPN 5,068,568) in view of Holland (USPN 4,311,725), and in further view of Rahn (USPN 5,483,378) and Nulman (USPN 5,754,297).

12. Regarding independent Claim 10, de Vrieze et al. teaches a method for forming an optical component, the method comprising depositing a plurality of optical layers on a base to form a surface. Specifically, de Vrieze et al. teaches a method of forming a multi-layer interference filter comprising a number of high-refractive index and low-refractive index layers alternately deposited on a base (i.e., the plurality of optical layers comprise alternating layers of lower refractive indices and higher refractive indices and form a stack) (Col.1, lines 13 – 64, Col.2, lines 33 – 41). The layers can be deposited by sputtering (Col.5, lines 46 – 50). In addition, de Vrieze et al. desire the layers to have a quarter-wave thickness (Col.3, lines 40 – 50, Col.4, lines 59 – 68). The number of layers is typically between 14 and 30 (Col.3, lines 40 – 43). De Vrieze et al. does not teach utilizing the applicant's claimed thickness controlling method. However, Holland teaches an analogous method of depositing a multi-layer interference filter on a base by sputtering in which the deposition can be terminated at a suitable thickness (Abstract, and Col.3, lines 43 – 47). Holland also teaches that, in order to obtain a quarter-wave thick film (i.e., as desired by de Vrieze et al.), it is required to terminate the deposition at a transmittance maximum (i.e., when the transmittance begins to decrease) (Col.4, lines 21 – 25). This is achieved by monitoring the transmittance in order to discern when the transmittance maximum has been reached (Abstract) (i.e., measuring and obtaining a first

transmittance (i.e., optical characteristic) value, measuring and obtaining a second transmittance (i.e., optical characteristic) value during continued deposition, determining if the transmittance maximum has been reached (i.e., if the transmittance value has decreased), and terminating the deposition only when this condition is met). It would have been obvious to one of ordinary skill in the art to utilize the thickness controlling method of Holland in the process of de Vrieze et al. with the reasonable expectation of (1) success, as both Holland and de Vrieze et al. teach analogous methods of depositing multi-layer interference filters on a substrate by sputtering, and (2) obtaining the benefit of utilizing the monitoring system of Holland, such as the ability to terminate deposition when a quarter-wave thick film has been deposited, as desired by de Vrieze et al. Neither de Vrieze et al. nor Holland explicitly teaches that the monitoring (i.e., thickness control) is performed for a "tuning layer" (i.e., a higher refractive index layer deposited on the plurality of optical layers and having a lower refractive index layer deposited thereon). However, Rahn teaches that, in the art of depositing an optical multi-layer film of alternating high and low refractive index layers (i.e., a process analogous to that of de Vrieze et al.), the optical characteristics of the multi-layer film are much more sensitive to the thickness of the high refractive index layers than to the low refractive index layers (Col.1, lines 39 – 56, and Col.2, lines 33 – 37). In addition, Nulman teaches that, in the art of monitoring the deposition of films, it was known at the time of the applicant's invention that the number of times a process is monitored is determined by the level of process control desired (Col.5, lines 20 – 24) (i.e., it is

a result / effective variable). Therefore, it would have been obvious to one of ordinary skill in the art to monitor the transmittance and control the thickness of any one of the high refractive index layers of the interference filter of de Vrieze et al. (i.e., including a "tuning layer" as claimed by the applicant) utilizing the monitoring method of Holland with the reasonable expectation of success and of obtaining similar results as compared to the situation in which all the layer thickness values are controlled, as Rahn teaches that the optical characteristics of the multi-layer film are much more sensitive to the thickness of the high refractive index layers than to the low refractive index layers, and Nulman teaches that the number of times a process is monitored is determined by the level of process control desired. Please note that the stack of alternating high and low refractive index layers of de Vrieze et al. is terminated by a low refractive index layer (i.e., terminating layer "1" – see Col.5, lines 1 – 8 and 25 – 50). Therefore, no matter which high refractive index layer of de Vrieze et al. is monitored and controlled (i.e., is selected as the "tuning layer"), there is always a low refractive index layer added on the high refractive index "tuning layer" as required by step (f) of Claim 10.

Response to Arguments

13. The applicant's arguments filed on 2/24/2003 have been fully considered but are not persuasive.

14. First, the applicant argues that there is no motivation to combine Rahn with Holland to achieve the claimed features of the present invention. Specifically, the applicant

argues that, since Holland teaches controlling the film thickness by using the optical transmittance of the deposited film, the layer thickness correction technique taught by Rahn is obviated and not necessary. In response, the examiner disagrees. Although Holland does teach controlling the film thickness by using the optical transmittance of the deposited film, Holland also teaches that errors in the thickness-controlling process, specifically determining the precise location of transmittance maxima and minima, can occur (Col.4, lines 21 – 29). To further support this point, Rahn teaches that practically, when films are fabricated on a substrate, available manufacturing tolerances when depositing the films can lead to films that are not exactly the correct thickness (Col.2, lines 24 – 28). Rahn's solution is to remove a portion of the deposited film (Col.2, lines 28 – 29). Therefore, it would have been obvious to one of ordinary skill in the art to perform the applicant's claimed removal process after the deposition process of Holland in order to correct errors in the "as deposited" film thickness and obtain a film of exactly quarter-wave thickness (as taught to be desired by Holland) by removing the "excess" portion of the film. In other words, the motivation for combining the references is based on increasing the quality (i.e., accurate thickness) of the deposited film(s) of Holland by compensating for and correcting (1) possible errors in locating transmittance maxima and (2) practical, available manufacturing tolerances.

15. Second, the applicant argues that Rahn, on whom the examiner relies for removal of the layer portion, is silent with respect to the removal being conducted during the period when the measured mean light transmittance is stopped and then

decreased. In response, the examiner agrees that Rahn is silent in this respect. However, it is the combination of Holland and Rahn that suggests the applicant's claimed invention. Please note that one cannot show non-obviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Briefly, Holland teaches depositing a quarter-wave thick film based on measuring the transmittance maxima of the film. This point is equivalent to the point at which the transmittance begins to decrease. In addition, Holland teaches that errors in detecting the transmittance maxima can occur (Col.4, lines 21 – 29). In other words, Holland suggests that the exact desired film thickness (i.e., a quarter wave film thickness) may not always be deposited. In view of Rahn, it would have been obvious to one of ordinary skill in the art to remove this "excess" film thickness from the deposited film(s) of Holland in order to achieve the exact desired film thickness, i.e., the quarter wave film thickness taught by Holland. This "excess" film thickness would correspond to the portion of the film of Holland deposited in the time period from the exact transmittance maxima to the point at which the measured transmittance is changed to be decreased, as claimed by the applicant. Please note that the test of obviousness is not an express suggestion of the claimed invention in any or all references, but rather what the references taken collectively would suggest to those of ordinary skill in the art presumed to be familiar with them (*In re Rosselet*, 146 USPQ 183).

16. Regarding Claim 10, the applicant argues that, although control of the deposition rate using optical characteristics is disclosed in the references, using the optical characteristics to achieve a certain thickness of a single layer - the "tuning layer" - by continuing or terminating deposition is not disclosed in any reference. In response, the examiner strongly disagrees. Specifically, Holland teaches terminating deposition at a transmittance maximum in order to obtain a quarter-wave film (i.e., a film having the required thickness) (Col.4, lines 21 – 24 and Col.6, lines 18 – 26). This is equivalent to using optical characteristics to achieve a certain thickness of the "tuning layer" by continuing or terminating deposition.

17. Also regarding Claim 10, the applicant argues that the examiner asserts that Rahn teaches the feature discussed above in paragraph 16. This is not the case. The examiner has relied on Holland to teach controlling the thickness of the layer(s) by using optical characteristics, not Rahn.

18. The applicant further argues that Holland only discloses terminating deposition at maximum or minimum reflectance, whereas the present invention continues or terminates deposition based on a thickness of the tuning layer and its optical characteristics. In response, Holland teaches terminating deposition at a reflectance or transmittance maximum or minimum corresponding to a desired film thickness (Col.4, lines 21 – 29). This is the same thing as continuing or terminating deposition based on the thickness of the layer (i.e., whether or not a desired quarter-wave thick film has been deposited) and its optical characteristics (i.e., its reflectance or transmittance).

19. The applicant then argues that none of Holland, de Vrieze et al., Nulman, or Rahn teaches or suggests that the "tuning layer" is one of higher refractive index. In response, the examiner disagrees. Rahn teaches that, in the art of depositing an optical multi-layer film of alternating high and low refractive index layers (i.e., a process analogous to that of de Vrieze et al.), the optical characteristics of the multi-layer film are much more sensitive to the thickness of the high refractive index layers than to the low refractive index layers (Col.1, lines 39 – 56, and Col.2, lines 33 – 37). In addition, Nulman teaches that, in the art of monitoring the deposition of films, it was known at the time of the applicant's invention that the number of times a process is monitored is determined by the level of process control desired (Col.5, lines 20 – 24) (i.e., it is a result / effective variable). Therefore, it would have been obvious to one of ordinary skill in the art to monitor the transmittance and control the thickness of any one of the high refractive index layers of the interference filter of de Vrieze et al. (i.e., including a "tuning layer" as claimed by the applicant) utilizing the monitoring method of Holland with the reasonable expectation of success and of obtaining similar results as compared to the situation in which all the layer thickness values are controlled. In other words, the combination of references relied upon by the examiner reasonably suggests monitoring and controlling the thickness of any one (or more) of the high refractive index layers of the stack of de Vrieze et al. (i.e., using a higher refractive index layer as the "tuning layer").

Allowable Subject Matter

20. Claim 9 is allowed. Claim 17 (which depends from Claim 9), is rejected under 35 U.S.C 112, second paragraph, for the reasons set forth above in paragraph 7, but no art has been applied against the claim. Claim 11 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

21. The following is a statement of reasons for the indication of allowable subject matter: Independent Claim 9 (from which Claim 17 depends) and Claim 11 are both drawn to a method for producing an optical component having a multi-layer film on a base. A plurality of alternating higher refractive index layers and lower refractive index layers are deposited on the base and form a stack. A "tuning layer" having a higher refractive index is deposited on the plurality of layers, and a specific thickness controlling process is carried out during the deposition of the "tuning layer" (i.e., measuring an optical characteristic, specifically the transmittance, of the stack, and controlling, on the basis of the measured optical characteristic, the thickness of the tuning layer by terminating the deposition when the measured optical characteristic is changed to be decreased). The portion of the tuning layer that is deposited from a time point when the increase/decrease of the measured optical characteristic is stopped to a time point when the measured optical characteristic is changed to be decreased is removed, and a lower refractive index layer is deposited on / added on the tuning layer to form the multi-layer film. The

closest prior art of record discussing the layer removal portion of the process is Rahn (USPN 5,483,378). Rahn teaches that, in order to correct for errors in both inner and outer layer thicknesses, a portion of the outer, lower refractive index layer may be removed. As such, Rahn does not teach or reasonably suggest removing a specific portion of a high refractive index tuning layer that is located below a lower refractive index layer, as required by Claims 9 and 11. Therefore, the prior art of record, alone or in combination, does not teach or reasonably suggest each and every limitation of Claims 9, 11, and 17 (which depends from Claim 9).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (703) 308-7557. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Wesley D Markham
Examiner
Art Unit 1762

WDM
May 29, 2003

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